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Effect of Phosphate Placement on Yields of Different Crops in West-Central Saskatchewan

Introduction

The effects of different phosphate placement methods on emergence, growth and yields of several cereal, oilseed and pulse crops were investigated in field trials on several different soils in west-central Saskatchewan. This paper presents a brief summary of the results obtained during the period 1972-76, comparing the yield response of the different crops to phosphate placement.

Materials and Methods

Ammonium phosphate fertilizer (11-55-0 or 11-48-0) was applied (1) with the seed, (2) 2.5 cm below x 2.5 cm to the side of the seed, and (3) 2.5 cm directly below the seed for wheat, barley, rapeseed, flax and peas on several soil types. Rates of phosphate in each trial were from 0 to 90 or 112 Kg P_2O_5/ha. Plots were arranged in randomized block design with four replications.

Results and Discussion

Wheat - Phosphate placed with the seed of wheat generally produced yields equal to or better than any other treatment. This crop appears to tolerate relatively high rates of phosphate fertilizer with the seed in most soil conditions. Only occasionally did wheat respond better to phosphate placed below - to the side of the seed. Placing the phosphate band below the seed was less effective than the other treatments. Response of wheat to phosphate placement as shown in figure 1.

Barley - Although differences in yield from the placement methods were generally small on most soils, this crop appeared to be less tolerant than wheat to seed-placed phosphate in certain soils and under conditions of low moisture. Banding phosphate fertilizer below - to the side of the seed was frequently superior to placing the fertilizer with the seed on grey-wooded soils, and occasionally on chernozemic soils under dry conditions, but differences in yield due to placement methods on the latter soils were usually small. Response of barley to phosphate placement in 1976 is shown in figure 2a, and the 5-year average is shown in figure 2b.

Rapeseed - Rapeseed does not tolerate high rates of phosphate placed with the seed. Up to 22 Kg P_2O_5/ha can generally be applied with the seed of rapeseed under good moisture conditions, but even this rate frequently produces lower

yields than from banding the fertilizer below - to the side of the seed. Rates in excess of 22 Kg P_2O_5/ha with the seed frequently produced no additional yield increase, or caused a decrease in yield, especially on grey-wooded soils. However, when banded below - to the side of the seed, the higher rates of phosphate produced substantial yield increases on phosphate deficient soils, as shown in figures 3 and 4.

Peas - This crop responds strongly to phosphate fertilizer on low-phosphate soils, but can tolerate only a small amount when placed with the seed. In order to maximize response to phosphate when applied at seeding time, the phosphate should be banded below - to the side of the seed. A phosphate band directly below the seed was considerably less effective, as shown in figure 5.

Flax - This crop is quite variable in its response to phosphate fertilizer. Flax is very sensitive to seed-placed fertilizer, particularly in light-textured soils with low moisture. Rates of phosphate as low as 22 Kg P_2O_5/ha have substantially reduced emergence and yields on some soils. Unlike the other crops studied, flax responded most strongly to phosphate when the fertilizer was banded directly below the seed on certain soils, producing relatively large yield increases, as shown in figure 6a. This effect was not consistent for all soils. Further research is required to determine the factors influencing response of flax to phosphate under field conditions and to determine the phosphate placement methods required for maximum response on different soil types.

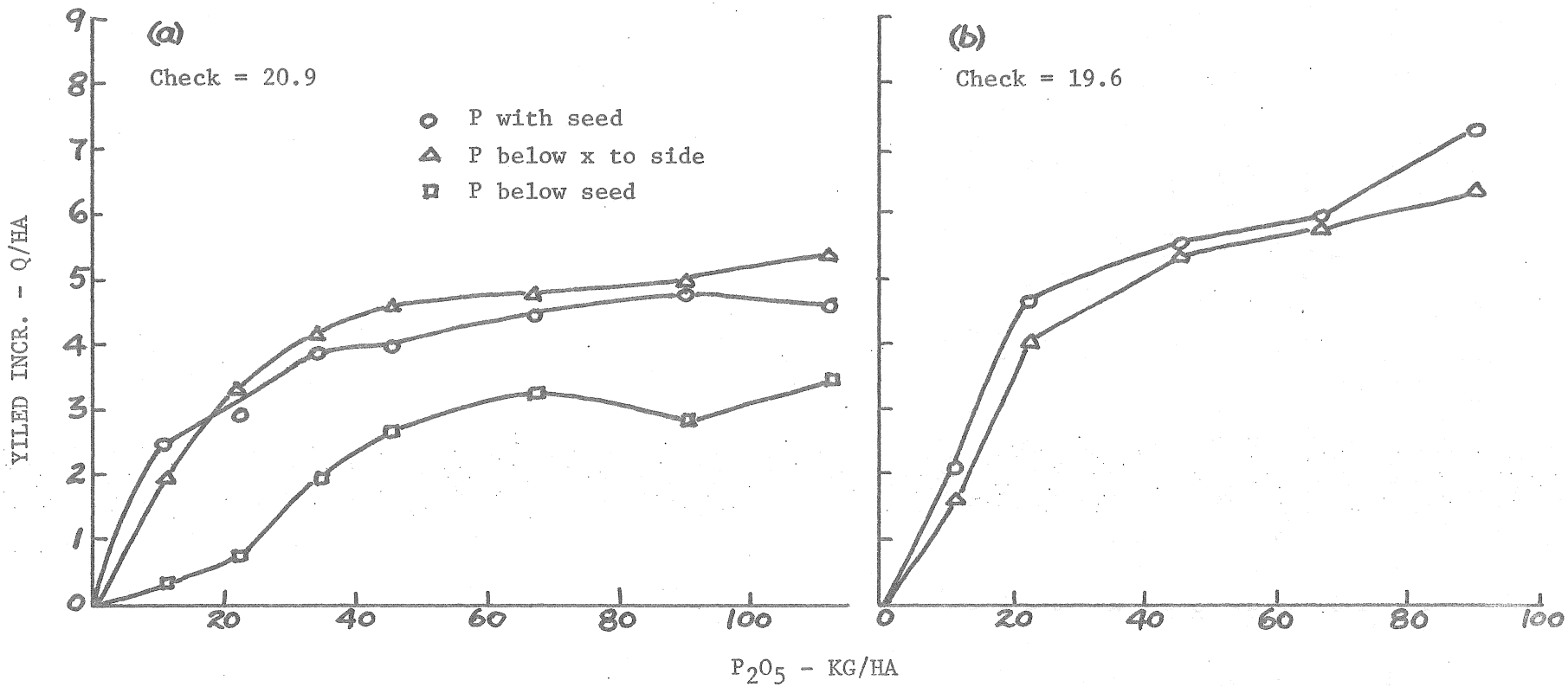

Figure 1. Effect of phosphate fertilizer placement method on yields of Neepawa wheat on fallow. (a) mean of five trials on four soil types in 1976, (B) mean of eighteen trials on four soils during 1972-76.

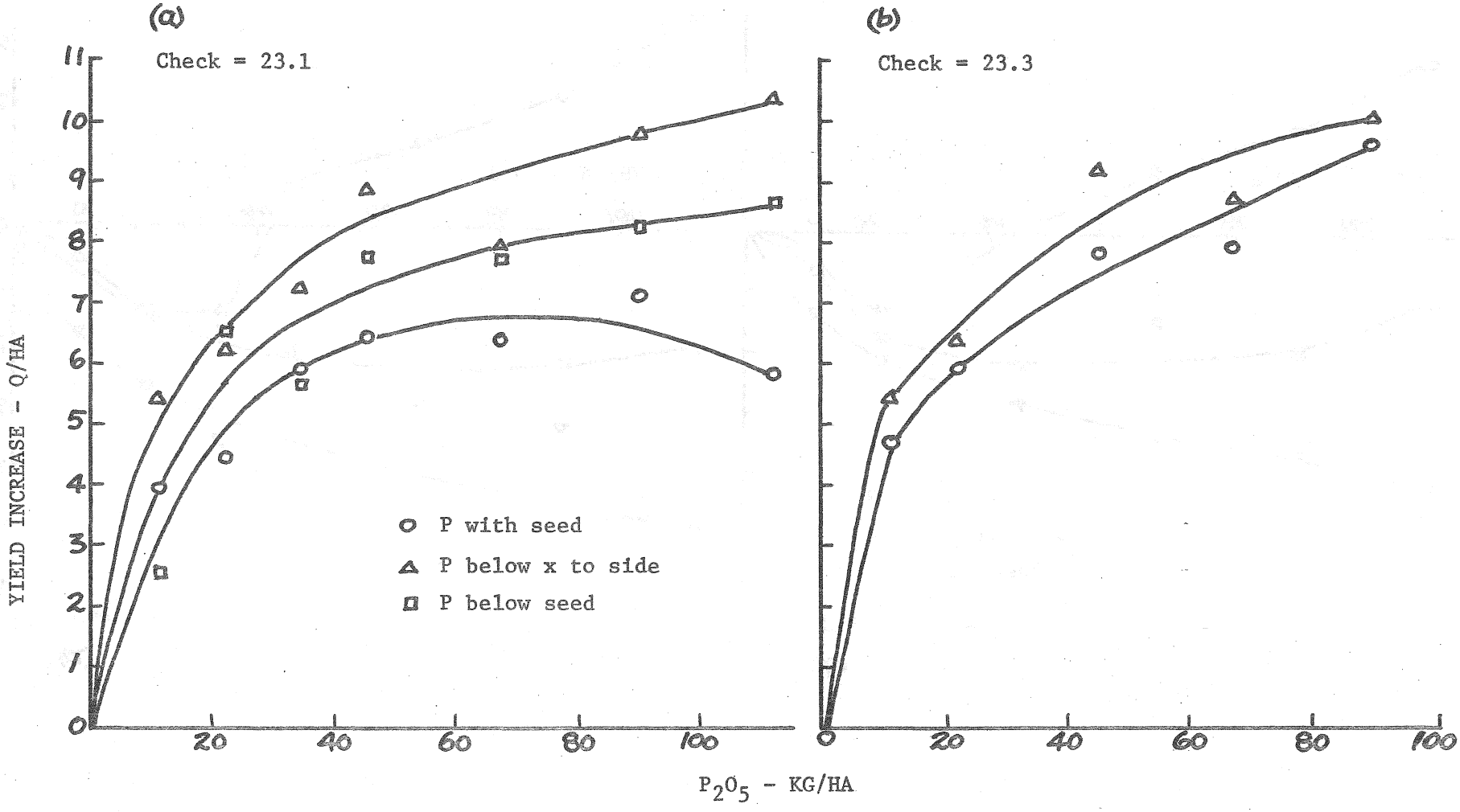

Figure 2. Effect of phosphate fertilizer placement method on yieds of Bonanza barley on fallow (a) mean of five trials on four soil types in 1976, (b) mean of twenty-one trials on four soil types during 1972-76.

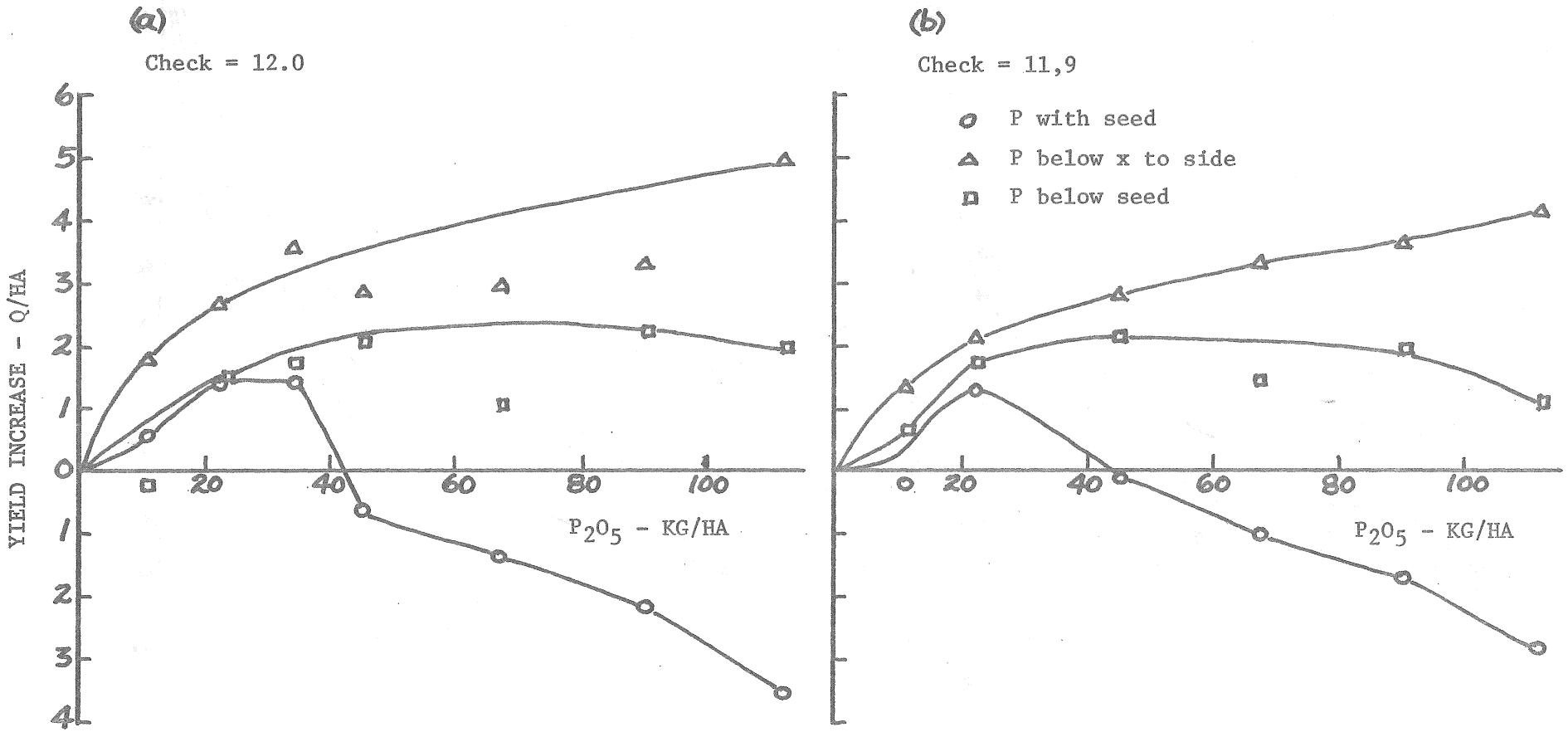

Figure 3. Effect of phosphate fertilizer placement method on yields of Torch rapeseed on fallow. (a) mean of five trials on four soil types in 1976, (b) mean of nine trials on four soil types during 1975-76.

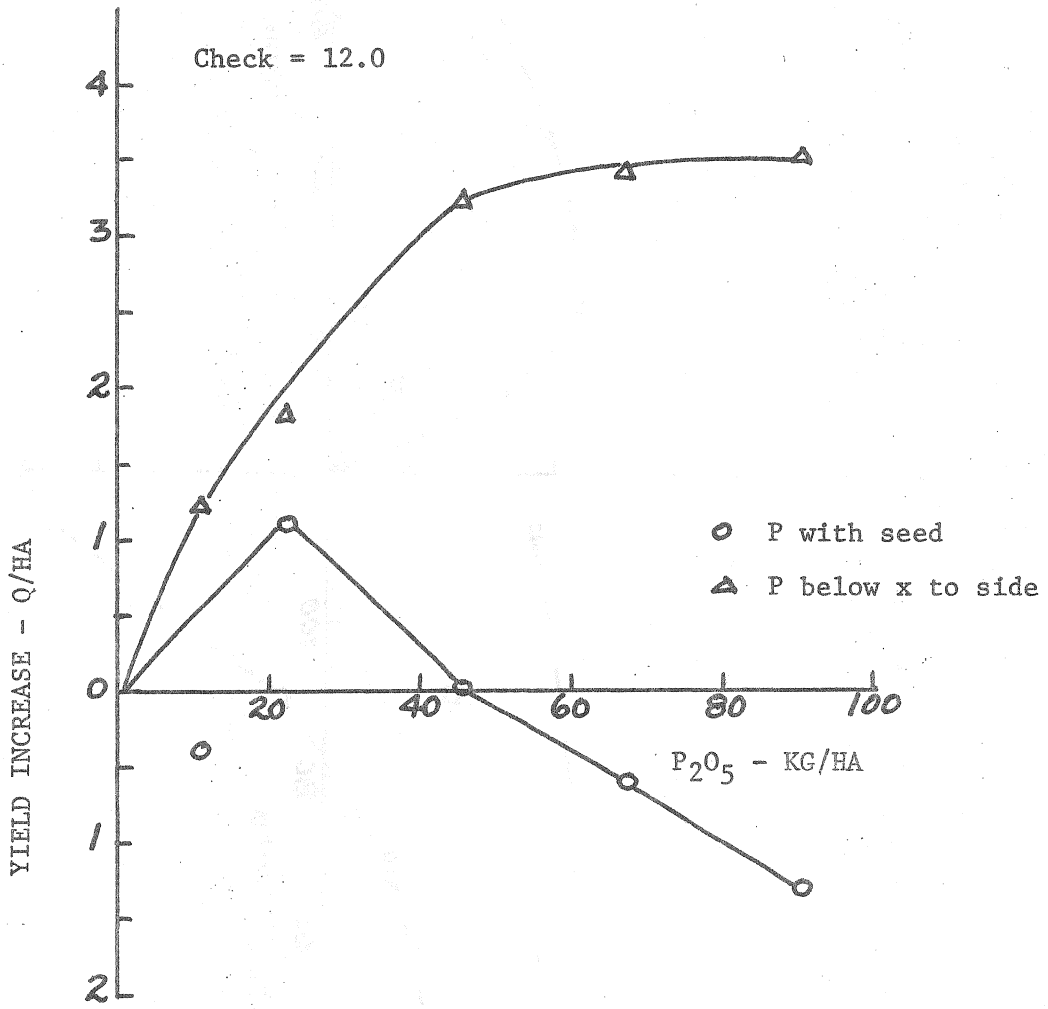

Figure 4. Effect of phosphate fertilizer placement method on yields of Torch rapeseed on fallow. Mean of twenty-one trials on four soil types during 1972-76 (5 yr.)

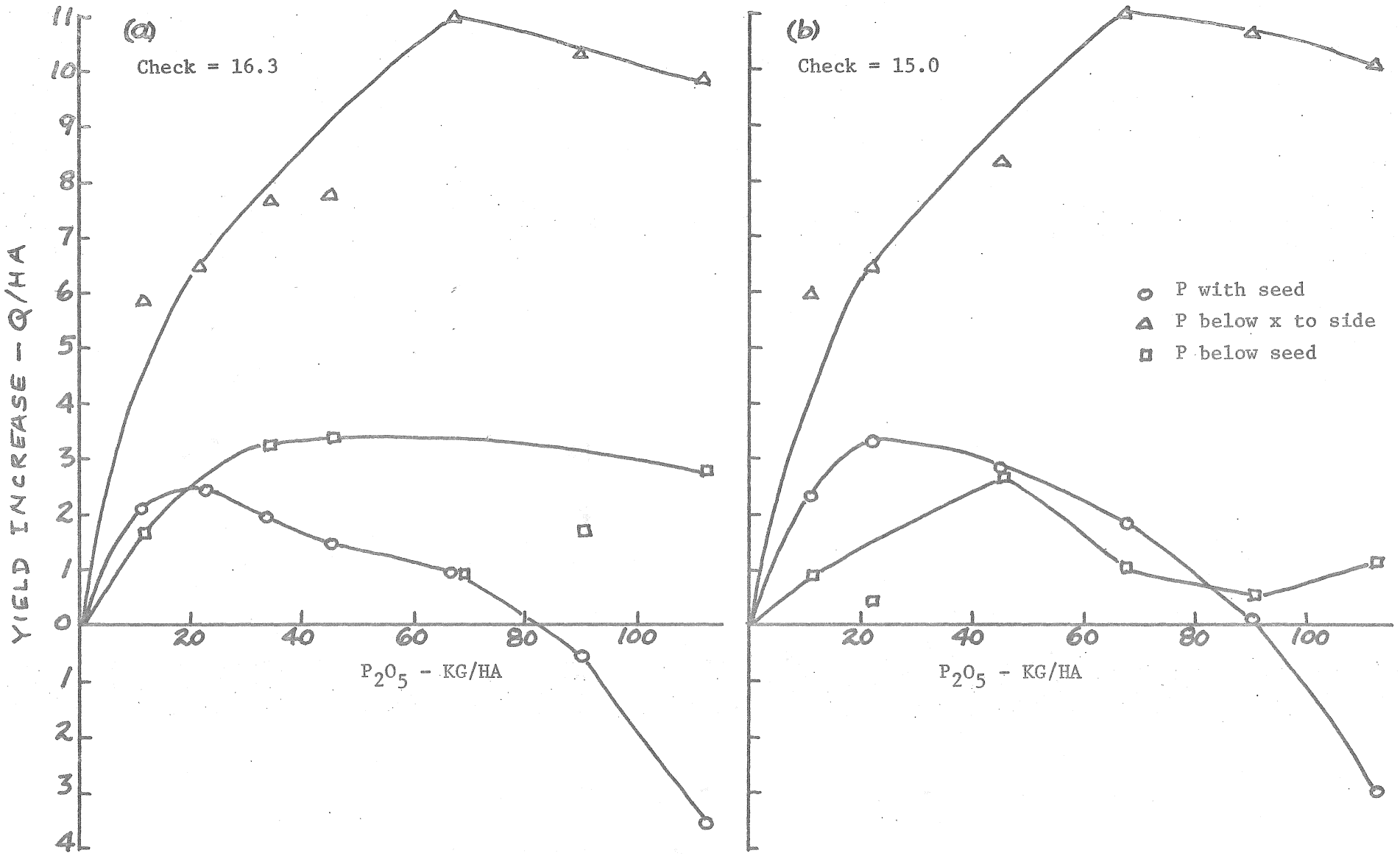

Figure 5. Effect of phosphate placement method on yields of Trapper peas on fallow. (a) mean of three trials on two soil types in 1976, (b) mean of five trials on two soil types during 1975-76.

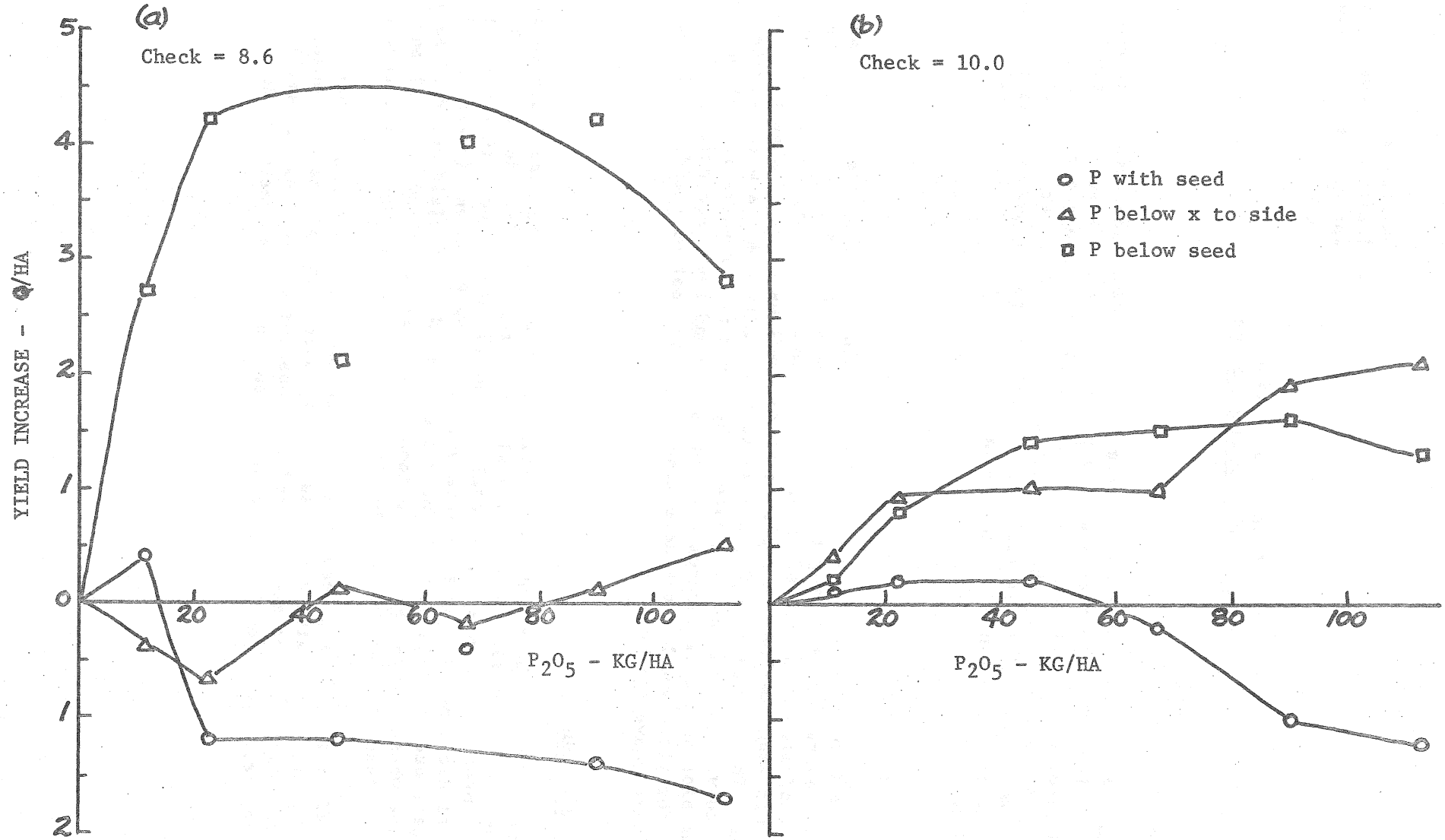

Figure 6. Effect of phosphate fertilizer placement method on yields of Noralta flax on fallow. (a) Elstow loam (Rosetown) 1976, (b) mean of 10 trials on 4 soil types during 1975-76 (2 yr.)